SENIOR SERVICE COLLEGE FELLOWSHIP RESEARCH PAPER

ACQUISITION SUPPORT FOR THE ARMY TRANSFORMATION CAMPAIGN PLAN

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ABSTRACT

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Although acquisition reform has provided the tools to improve the way we do business, are the tools adequate to the task of supporting the Transformation Campaign Plan (TCP) and its key component, the Future Combat System (FCS)? We cannot afford to consider acquisition support for the TCP as just another acquisition program. This paper will review some of the most important parts of existing acquisition policy and assess whether or not it is adequate to support the TCP or if there needs to be more work accomplished. It will consider acquisition strategies, concerns about personnel management policies (technical expertise we need, how to develop it, and whether it should be military or civilian), prioritizing and managing our research and development, and how to assess the impact of a rapidly accelerating high technology revolution on all acquisition processes. Crucial to accomplishing the TCP is mobilizing industry to support the ambitious goals set forth in the TCP. Fear over being accused of giving any one company an advantage has limited the Army's communication with its key suppliers over the years. What should our relationship with the defense industry be, and will existing regulations allow the Army to relate to industry in a way to insure success? This paper will also explore the acquisition process as a complex adaptive system, and provide suggestions on how to manage the FCS in light of recent research on this topic. The task at hand is to consider these issues and provide some suggestions on how the acquisition community and the defense industry can best support the TCP.

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PREFACE

I want to thank Dr. Walter LaBerge for his patient tutoring on new ways to think about the acquisition process. He demonstrated how one could learn from past programs, especially those from other services. He also showed that transformation is not new. He explained how we have successfully managed very radical transformation in past times, and that it is helpful to recall those efforts and apply lessons learned to the new technologies and situations.

I want to also thank Dr. Kenneth Flamm for providing the theoretical framework and practical tools for help in understanding the defense industry. I want to especially thank him for allowing the use of his draft research on the post cold war defense industry.

I am indebted to Professor Ruben R. McDaniel, Jr. for helping me to understand the very recent science of complex adaptive systems and how to use this science to better understand the world we face and better manage and lead our way into the future.

ACQUISITION SUPPORT FOR THE ARMY TRANSFORMATION CAMPAIGN PLAN

The Army's Transformation Campaign Plan (TCP) is about changing the way the Army fights. If changes in the strategic environment have caused the Army's senior leadership to direct rapid and revolutionary changes in how we fight, does this not also mean that the acquisition community must also change? The acquisition system has gone through a series of evolutionary changes that have accelerated over the last decade. However, to support a revolutionary way of fighting, the acquisition system must also undergo revolutionary change.

The imperative to change is firm, and the time frames are very short. The current plan calls for the fielding of the objective force to begin in 2010. "Traditional" acquisition methodologies are inadequate to meet this goal, yet the Acquisition community has been in a period of acquisition reform for quite some time. Mr. Gilbert Decker, a former Army Acquisition Executive stated in September of 1996 that, "I need your help to institutionalize Acquisition Reform," as he sought to implement an acquisition reform strategy.[1] The Acquisition community has been changing. There have indeed been many changes in regulation and policy over the last decade. The question is why the changes that have been made have not been enough to support the TCP. Dr. George H. Perino argues that we have not paid sufficient attention to how we manage the iterative processes, such as spiral development or evolutionary acquisition.[2] He further states that, "Despite the need to do things differently, some things remain unchanged and, to a large extent, unrecognized."[3]

The acquisition process begins with a requirement. Along with a requirement, a funding line to support it is required as a matter of law. The requirement then has to be defined sufficiently for the contracting community to obtain the services of a contractor to begin the process of systems development. A clearly defined requirement has usually been necessary to meet the conditions of competition required by the congress through the laws it has passed.

Program Managers have to plan around contracting regulations, testing requirements, milestone review requirements, and the list goes on. None of these things are inherently bad.

The American people, represented by their elected representatives, require and deserve accountability for their money. Although proper accountability would seem obvious, it cannot be said often enough that professional Army Officers and DA Civilians are public servants. Reporting to Congress or those designated by the President to conduct oversight is NOT a burden to "tolerate" or "minimize". It is a sworn duty. The objective is to do it intelligently, so that the war fighter can accomplish his duty, which is winning wars. Dr. Paul Kaminski, a former Defense Acquisition Executive stated in April of 1995 that, "We must move away from a pattern of hierarchical decision making to a process where decisions are made across organizational structures by integrated product teams. We must shift from an environment of regulation and enforcement to one of incentivized performance."[4] It is a professional duty to continually inform those served when the laws must be changed to meet new situations. Therefore, the first critical question to answer is whether the acquisition community has the tools needed to support the Transformation of the Army or must there be more changes in the laws and regulations under which we work?

The most important component of acquisition is a motivated and competent workforce. The start of transformation will be accomplished with the current workforce. There will not be time to train new people. Personnel policies, however, motivate people to move in or out of the various specialties, and Transformation will continue for many years to come. Is the needed technical expertise presently available in the Officer Corps? Must the Army rely strictly upon the civil service to provide all the necessary technical expertise? These are not new questions, but there has never been a definitive answer, nor is there any official policy either encouraging or discouraging pursuit of technical expertise. The Acquisition Corps has still not addressed the issue of "qualifying" positions in a way that can be understood by combat arms officers such as

the Operations and Executive Officer positions. Instead, promotion and school board results have been allowed to provide "guidance". Is this situation acceptable, and what might be the impact upon Transformation?

The Defense Acquisition University has seen dramatic changes since its inception on August 1, 1992. It has evolved from the consolidation of the various service schools that taught the regulations and how to conduct the Government's business. It has expanded the curriculum to include teaching good business principles, emphasizing a curriculum that provides program managers and business managers the tools needed to meet each situation in a flexible manor.

Has this been sufficient? Certainly it is not the regulations holding back creative applications. FAR 1.102(d) states, "The role of each member of the Acquisition Team is to exercise personal initiative and sound business judgment in providing the best value product or service to meet the customer's needs. In exercising initiative, Government members of the Acquisition Team may assume if a specific strategy, practice, policy or procedure is in the best interests of the Government and is not addressed in the FAR, nor prohibited by law (statute or case law), Executive order or other regulation, that the strategy, practice, policy or procedure is a permissible exercise of authority."[5] Clearly the intent is to do what makes sense and what best fits a situation rather than a blind adherence to the written word. Yet complaints are still heard from program managers about contracting personnel being too "rigid" and insufficiently creative and flexible.

If this attitude continues to be pervasive, perhaps the acquisition leadership needs to look at how the workforce is educated. Dr. Tony Perino, a member of the Defense Systems Management College (DSMC) faculty, believes that DSMC management needs to do more to educate both faculty and students regarding the demands of complexity, including learning theory and human learning capacity under different conditions.[6] Or is it a leadership problem, rather than a "training" problem? The two are inextricably related. In order to solve the problem

of a workforce that is perceived as too inflexible the acquisition leadership must change the way both the workforce and the leadership is trained.

Army transformation is reliant upon using state of the art technology to overcome the problems associated with matching strategic mobility with overmatching lethality and survivability. LTG Kevin P. Byrnes, Deputy Chief of Staff for Programs, stated in the Nov-Dec issue of Army AL&T that, "The seedbed for innovative technological advances in these systems, especially ones to be developed, can be found in Science &Technology (S&T) efforts that are exploring revolutionary technologies."[7] However, there are several questions that must be answered to assure the Army senior leadership that our S&T effort supports their evolving war fighting doctrines.

Revolutionary technologies don't often occur without concerted effort and management. And these technologies must be relevant to the war fighters. The most revolutionary technology is useless if it doesn't fit into how the war fighters intend to conduct war. But, on the other hand, according to Dr. Walter LaBerge, some of the most useful weapons in the Air Force came from technologies that were discovered and developed in the independent research laboratories despite what the requirements community had explicitly requested.[8] Is this a contradiction or does it speak to the need for improving the relationship between the requiring activities and the S&T activities? How well does the Army manage the transition of technology from the laboratory into applications useful to soldiers? There have been many recent changes in this process, some controversial. Does our collective Research & Development (R&D) system support the TCP?

If Army transformation is to gain momentum and be supported it will, in the end, be the defense industry that provides the material solutions. There has been massive change in the defense industry over the past decade. Whether this change has been positive or negative has yet to be determined. However, the Army must communicate to industry what is required as

accurately as possible so industry can more quickly adapt to the changing circumstances. Especially regarding such critical issues as internal research and development, production capacity, and financial requirements. This type of communication has not been common in the past. In fact, such communication has been purposely ambiguous in an attempt not to prejudice one potential contractor over another. Contractors have been zealous in protecting proprietary information, even accusing Federal Officers of not adequately "protecting" their information. This environment creates fear and mistrust, and it is unnecessary. This most critical issue of how to work with industry before the contracting process even begins must be addressed.

The purpose of this paper is not to provide a definitive answer to every question raised. Rather, it is to demonstrate that we must think differently about how the acquisition process is managed. This paper will carefully consider exactly what the regulations and policy say in regard to these issues. It will also examine the acquisition leadership's policies by considering the body of acquisition publications. In the author's experience, most problems with creativity and flexibility stem directly from a combination of inadequate education, lack of confidence due to a lack of experience, fear of what the senior leadership expects, or a profound fear of not being supported by the acquisition leadership when mistakes are made, things go wrong, or a situation becomes "political". Fear always inhibits creativity.

This paper will also provide some recommendations on how the Army's acquisition leadership can encourage the acquisition behavior needed to support the Army's Transformation. Instead of thinking of the acquisition process as a linear, deterministic process, this paper will show that it is instead a non-deterministic, non-linear process. As Mr. George H. Perino states, "Real-world defense systems acquisition problems are largely non-deterministic in their behavior."[9] Finally, some thoughts will be provided on how to manage what is essentially a complex adaptive system.

ACQUISITION REFORM PROCESS

From the material point of view, the Future Combat System (FCS) is the element of Transformation upon which the acquisition community must focus. Unlike previous systems, for instance the M1 ABRAMS, the FCS is to be a "system of systems". Instead of stating that the Army needs a tank, or a personnel carrier, or any other platform, one simply states broad requirements that are not necessarily platform dependent. This is very different from past requirements, and it is the first part of the transformation puzzle that should be considered. The FY 02 Army Posture Statement says in part, "To accelerate development of key technologies, the Army, partnered with the Defense Advanced Research Projects Agency in a collaborative effort for the design, development, and testing of FCS while *simultaneously redesigning the force*" (emphasis added).[10]

The first challenge is that of requirement definition. Is it animal, vegetable, or mineral? The correct answer is that it should not matter. Instead, broad performance characteristics should be defined, making it clear that there will be changes as both technologies and situations evolve. Since June of 1994, performance specifications have been the preferred method of doing business.[11] This is not new and it has been used in the past. However, it has never been applied in such a broad fashion. But the Secretary of Defense Guidance given in June 1994 Memorandum was clearly intended to go further than it has been used. The guidance states, "To the extent practicable, the Government should maintain configuration control of the functional and performance requirements only, giving-contractors responsibility for the detailed design."[12] This means that the requirements community must be flexible during the acquisition life cycle. The Leadership must be willing to admit that it doesn't know exactly what is wanted and instead focus on defining capabilities that enables the Army to fight the way the Army leadership envisions. Further, requirements activities must be prepared to rapidly evolve requirements with the acquisition managers as the Army leadership guides us into a disturbing

future filled with an uncertainty that is now the norm. Rather than a relationship of "demand and deliver", all parties to the process must establish a relationship based upon a common interest and devote the time and personnel to a continuous conversation.

As described previously, if the Army is to conduct simultaneous development of material and force structure, then there cannot possibly be a one-time solution. In the past the focus was on defining requirements and then structuring a strategy in terms of how to contract for the development and production of the requirement. In reality, the requirements community often had preconceived ideas on a particular platform and contractors would try to make adaptations to their particular hardware solution to fit into these preconceived solutions. For many years the process worked (by and large), because all parties did have a pretty good understanding of the threat. The Army thought it knew what it wanted, contractors thought they knew what was being asked for, and the contracting folks would help everyone muddle through the changes that inevitably occurred.

But all of this has now changed. The Army does not have the luxury of assuming it knows what will be needed, nor can it define a clear threat. The acquisition leadership cannot afford to allow the contracting process to control how program managers think about acquisition. Contracting is only a *means,* and though a crucial part of the process, should never drive acquisition strategy. Transformation of the Army is upon us and it will be evolutionary. DODI 5000.2 states, "An evolutionary approach is preferred. Evolutionary acquisition is an approach that fields an operationally useful and supportable capability in as short a time as possible. This approach is particularly useful if software is a key component of the system, and the software is required for the system to achieve its intended mission. Evolutionary acquisition delivers an initial capability with the explicit intent of delivering improved or updated capability in the future."[13]

Let us consider program management. Typically, when a technology reaches a particular level of maturity, the Army Acquisition Executive will assign a program manager (PM) to develop the technology for incorporation into a weapon system. (Prior to this, it is managed within the (S&T) community.) It is then handed off to a designated PM who manages the program through the various milestone reviews through the program's life cycle. However, this is not a model described by the Army Leadership for the TCP. What they describe is a collaborative model. And this collaborative model of program management is also a preferred methodology. DODI 5000.1 states in part, "The objective is an environment characterized by mutual understanding of key systems in a given mission area; shared decision making and close cooperation between the requirements, test and evaluation, and acquisition communities; and disciplined control over the development and introduction of acceptable interoperable systems."[14] Certainly the regulation is speaking to interoperability between the services and allies.

But should this principle also not apply to our system of systems? Decision-makers must also keep in mind that the overarching guidance in the DODI 5000.1 states that there is no one best way to structure an acquisition program. Decision-makers and program managers must tailor acquisition strategies to fit the particular conditions of an individual program, "consistent with common sense, sound business management practice, applicable laws and regulations, and the time-sensitive nature of the user's requirement."[15] The Future Scout program used such a collaborative team approach, which began early in the R&D phase, and transitioned with many of the same personnel who began the program: R&D, program management, and contracting. This program avoided many of the problems associated with the more traditional breaks between these two phases of program management.

So far, performance based requirements, an evolutionary acquisition strategy, and some type of collaborative program management model have all been considered, all of which are the preferred methods of the various policies and policy makers. There have been previous

programs that have used each of these tools described. What makes the FCS so unique is that all of them must be used and thought of in non-traditional ways. The contracting community will have to be very creative to make this happen in a timely fashion. Why not, for example, execute a multi-year contract that crosses more than one milestone review? Certainly this would be within the spirit of the DAE Memorandum referred to earlier, which also states that the PM form integrated product teams comprising both the PM and the necessary OSD review activities.[16] The goal is to tailor not just the acquisition strategy, program management methodology, and contracting techniques, but also the oversight. The challenge of the FCS has little to do with restrictions of the regulations and laws, but rather the creative application of all that acquisition reform has wrought, and the team building needed to establish common objectives amongst all concerned.

Again, what are being discussed are really relationships. How the different "agents" (i.e. the contractors, requirement folks, program managers and contracting personnel) interact is crucial. The misguided ideal of a specification that states exactly what is wanted, the perfect contract that defines everyone's rights and duties, and the acquisition strategy that lays out "the plan" that will persist into the indefinite future to program maturation is a pleasant myth that can no longer be tolerated. In order to take full advantage of the evolutionary approach, acquisition managers must consider a different way of defining these relationships to better adapt to the unknown and unknowable possible outcomes as well as to deliver on time and within budget. But is our acquisition workforce up to the task?

TECHNICAL COMPETANCE

Current Army policy accesses officers to meet requirements for junior grade officers. The ROTC slogan reflects the values that have been important to past success: "Scholar, Athlete, and Leader." The Army then focuses on developing leaders in the basic branches. From a pool

of successful leaders, it then draws basic branch officers who demonstrate the desire to continue their careers in technical specialties. If there are insufficient numbers of volunteers, then boards meet to access officers who have the best aptitude or educational background to be successful in the requisite technical specialty. The recent restructuring of the Officer Personnel Management System reflects the Army senior leadership's desire to provide career progression and advancement opportunities to officers who choose or are chosen for these technical and support specialties. The Acquisition Corps is one such specialty. The Acquisition Corps has been in existence for over ten years. However, has it produced officers who are sufficiently trained in technical specialties to meet the Army's needs?

According to Dr. La Barge, the Army is not well represented technically at the Department of Defense level. "The Army has almost no technological representation on the Defense Science Board," stated Dr. LaBerge in a recent address.[17] He further stated that though the Army has sent great soldiers to represent it at the Defense Science Board, they were unable to make significant contributions. These representatives are all flag officers. He continued by saying that over 80% of the technically qualified officers in Defense Advanced Research Programs Agency (DARPA) are Air Force Officers. The Army needs to investigate how it trains and manages commissioned officers to represent it in these critical DOD activities.

Currently, the Army has only one slot for an officer at DARPA, a LTC position. There are other officers at DARPA, but they are assigned to specific programs that will eventually transition to the Army. The Army currently has an officer in a PhD program to fill this position. Can a LTC be influential at DARPA when the typical senior DARPA official is a civilian scientist in an SES grade, with multiple degrees, and decades of experience, or are they relegated to be project officers, excluded from a significant decision-making role, thus unable to adequately represent the Army's senior leadership?

Another significant consideration is that of command. The Acquisition Corps still requires service as a battalion and brigade level commander to advance through the ranks. Is there time for an officer to obtain a PhD, gain experience and still be competitive for a command? There are, in fact, other officers in the grade of LTC and COL with technical PHD degrees. Most of these are acquisition officers serving in positions that do take advantage of these advanced degrees. Is there a sufficiently defined career path so that the best qualified of these highly trained officers can attain sufficient rank to represent the Army on the Defense Science Board?

Currently, the Army has no defined system for accessing, developing, and promoting officers with the requisite technical degrees to adequately represent it in the DOD R&D process. The reason this issue is important is because DARPA has been given the lead to develop the FCS, and the Army Research and Development Centers (ARDEC) are teaming with DARPA to expedite the development of the FCS. In the past, the program life cycle was sufficiently long to allow war fighter oversight. Is the Army leadership satisfied to allow civil servants and contractors to develop the FCS? Should not commissioned officers that are technically trained be more involved in the R&D process?

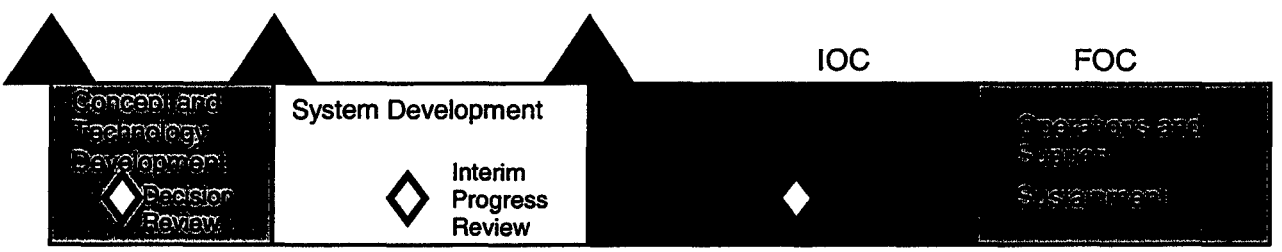
The issue is not that there is no longer time in a reduced acquisition life cycle to make significant adjustments, but that Army leadership must determine a way of making program adjustments more quickly. Having technically competent commissioned officers involved in the R&D process as early as possible is one means of insuring that the Army senior leadership's concerns are addressed and problems identified more rapidly in order to mitigate risk. The Army leadership cannot allow the reporting of program problems to be delayed either by contractors who might be motivated by fear of losing program funding or civil servants who may be overly concerned that they could be "restructured" and forced to move or change programs. Nor can the Army leadership afford to slow the process to allow more oversight. Indeed the

Army must continue to accelerate technological development and incorporate it into how it fights.

More than ever, we need technically trained officers representing senior leadership at the DOD. Especially if we intend to influence how the oversight process works, and work within it, not outside of it. Again, what is important it is defining the Army's relationship with a critical part of the acquisition process, that of analysis and oversight.

RESEARCH AND DEVELOPMENT

The Army leadership's guidance to the research and development community as contained in The Army Vision is threefold: recapitalize the Legacy Force with upgrades such as the insertion of digital technologies; provide answers by 2003 on how to make the Objective Force more responsive, deployable, agile, versatile, lethal, survivable, and sustainable than the Legacy Force; and then develop the choices made by the Army leadership. However, with decisions on technologies being made in 2003, there are only five years remaining to begin fielding the FCS by 2008. In a briefing on August 28, 2001, the Communications and Electronics Command (CECOM) presented a revised acquisition model to reflect a more rapid acquisition cycle.[18]



The important concept is that there is not a clear-cut point at which all program decisions are made, which previously has been at the milestone reviews. Although contracts do tend to follow

the appropriations cycles, and for good reason, delays would often be built into a program by structuring contracts around these milestone decision reviews. This is a self-inflicted wound that need not occur. This acquisition model demonstrates that there are still new ways to think about and accelerate the acquisition process. We are limited not by our imagination, but by our willingness to both better understand the process and focus on managing the complex organizational relationships.

This model clearly attempts to incorporate the guidance issued by Dr. Paul Kaminski to "move away from a pattern of hierarchical decision making to a process where decisions are made across organizational structures by integrated product teams."[19] It can be argued that the acquisition community is still hierarchically organized, with ill defined-relationships, especially with the DOD. PM offices are indeed multifunctional, but having multi-disciplined personnel on a team does not make it an integrated product team. *There must be relationships with all parts of the process.*

However, as an attempt to reflect a more evolutionary process, there are three technology insertion points: A, B and C. This alters the relationship between the research effort and the development effort. Although there remain excellent arguments for an independent research effort, I believe integration into a program must come earlier than in the past, and *continue throughout the life cycle.*

This model causes changes regarding how to think of the product's development cycle. Instead of deciding on a definitive technology or set of technologies for a new system, the program must focus on a structure that can evolve as technologies mature. This model should cause acquisition managers to more closely resemble private industry's approach to product development, where the scientists and program managers are teamed early in the product concept phase (this is much closer to the IPT concept), and remain together throughout the product development phases, often becoming an integrated division within the company. The

idea of "handing off" a technology to a newly appointed program manager who forms a "team" seldom previously associated with the technology or system is simply not done in industry. The recent PEO/PM reorganization seeks to define such a relationship by placing a Director for Science and Technology in each PEO. It further directs that selected science and technology funds (6.3) flow through these new Directors.[20]

What must be done is to *redefine the relationships* between the requirements, acquisition, and logistics support communities. There are two huge currents of change that challenge the current acquisition structure. One is the rapidity of technological advances that force the Army to redefine its requirements from hard and fast definitions, to requirements that are mission oriented, and recognize a continuum of change. The other involves rapidly evolving information systems combined with program management evolving to encompass the entire life cycle management of a system. This means that evolutionary development will occur, as the war fighters demand the latest and greatest technology. There has been a gradual move to put authority into the PEO/PM structure where previously there was responsibility but no authority. In the acquisition business, authority goes with the funds (no funds, no authority). But should all of this authority, to include R&D, be in the hands of the program managers?

Dr. LaBerge states that relationships are more important than detailed fidelity. There needs to be a very real and continuous personal communication between those responsible for the Army and the DOD acquisition oversight. He further believes that to obtain true analysis among the various technology options when deciding what systems to develop and field, the people responsible for this analysis need "political" protection.[21] They need protection not just from a senior leadership looking for the "right" answer, but also from their R&D leadership. The concern is that the Army has a structure for challenging its own assumptions and insuring that programs that go forward to the DOD reviews are believable, and reflect good science and analysis. The key is to insure that we have qualified and *educated* personnel who can

adequately analyze program options. The officer corps is well trained but few are educated in the way that scientists are educated. This is a root cause for misunderstandings and conflict between the R&D community and commissioned officer corps. For example, has the R&D system refocused on soldier systems needed to combat terrorism? Clearly events have demonstrated the need for improvements for close combat and soldier oriented systems. Dr. LaBerge stated in a recent correspondence, "Terrorism-useful technologies are concentrated at the man on man level, not those of company or battalion..."[22] How these issues are addressed structurally within the Army needs to be studied.

CONDITION OF THE DEFENSE INDUSTRY

According to Dr. Flamm, the winding down of the Cold War at the end of the 1980's caused an atmosphere of crisis to pervade the discussion of national policies toward defense industries around the world. The logic underlying the gloomy prognosis was simple: with radical cuts in defense budgets a seemingly inevitable outcome because the major threats driving the military buildup of the 1980s disappeared, military establishments were faced with some tough choices. Ultimately they would be forced to shut down a significant portion of their defense industrial capacity.[23] As in all consolidations, there is the ever-present problem with balancing the reduction of suppliers to reduce overheads and the resultant reduction in companies to compete for the remaining defense business. In his analysis of this so-called industry crisis, Dr. Flamm looked at the impact of the policy responses that in his words "danced around" this central question. "The major problem is that the fundamental policy tradeoff in shrinking its industrial base – economies of scale vs. competition – was not made the focus of the Pentagon's policies, and that, to this day, DOD still lacks an intellectual or analytical framework to guide its judgments on these issues."[24] The reason it is important to consider the condition of the defense industry and the consequence of the DOD policy is simple: cost. A general

assumption at the beginning of the restructuring of the 1990s was that consolidation would reduce overheads and lower costs. By and large, there is little evidence of this. A consequence of the situation is summarized by some questions recently asked by BG John Holly. "How [do we] resource restructured industry activities; and what policy of present/currently incurred cost [should be assigned] to a system when the defense industry restructures? [and]; how to manage increased rates resulting from industrial changes?"[25]

The defense industrial base generally consists of several parts: aircraft, automotive, ship, munitions, space and guided missiles, electronics, service companies, and numerous primarily commercial companies that also work defense contracts. The last category is usually in the electronics business, but this category also includes the numerous construction and build to print shops. The concerns, however, are those companies that do principally, if not wholly, DOD work. In the past, even until the 1980s, each service "managed" its own base of suppliers.

DOD policy simply did not exist. Until 1947, the DOD did not exist. The first policies enacted by DOD were the formation of the Defense Contract Audit Agency and the Defense Contract Administration Service. This was the beginning of managing what was becoming a more DOD oriented supplier base. Dr. Flamm stated simply, "The facts of the evolution of the U.S. Defense industry are poorly understood."[26]

Part of the answer relates to the real condition of the defense industry. Dr. Flamm shows how the consolidation of the 1990s has been overstated. Essentially, consolidation began in the 1980s. The number of companies producing in 1982 was about the same as the number producing in 1992. What changed, according to Dr. Flamm, was the increased cost of R&D for high tech platforms, which resulted in fewer programs; thus, "a reduction in the number of producers that can be sustained on an ongoing basis."[27] The reasons for consolidation are, therefore, not always apparent. The impact on cost structure is also different. What we commonly think of by the term "excess capacity" are things, buildings and tools. "It is a massive

increase in the R&D investments and technical capabilities required to design leading edge military equipment (*and possibly management overhead*), not excess factory capacity that leads one to focus on reducing the number of producers."[28]

Dr. Flamm concludes that there has been a significant decline in both procurement and the number of prime contractors. "In short, the U.S. defense industry does not currently seem to be mired in economic crisis. The number of firms, ironically, appears to have at least as much capacity to keep busy – and pay for in overhead charges – as in the early 1990's. The moral, perhaps, is that a poorly designed – or excessively constrained – policy, however noble its intentions, may simply make matters worse."[29] Reductions in numbers of producers do not necessarily result in lower rates on specific contracts or programs. It is possible that they could even increase.

UNDERSTANDING AND MANAGING ACQUISITION AS A COMPLEX ADAPTIVE SYSTEM

As in most things in our relatively free economy, most industries evolve to meet needs. These "self organizing networks" are a key indicator that a complex adaptive system is at work. According to Phillip Anderson, "no single component dictates the collective behavior of the system: such systems self organize."[30] Not only do they self organize, they interact with each other. "[A]gents co-evolve with one another. Each agent adapts to its environment by striving to increase a payoff ... the equilibrium that results from such co-evolution is dynamic, not static."[31]

Not only is the evolution of the U.S. Defense industry poorly understood, it is also *not understandable* in the traditional management sense. It is a non-linear relationship that has been treated using simplistic reductionism. It is no wonder that Dr. Flamm concludes that, "Bad data and a nonexistent analytical framework add up to, at best, inconsistent and only sporadically effective policies."[32] It is more important to evaluate the DOD's relationship with the defense industry before it can even begin to propose policies to deal with this problem. The

reason that there are problems controlling rates is that no one is *or can be* "in control." In a complex system, changes are often not known, and inherently unknowable. Does this mean that nothing can be done to keep our programs costs lower than they would be without managerial effort? Certainly not! But cost estimate relationships cannot be managed as they have been in the past.

Decision-makers are forced to conclude that they simply do not know what the potential effects of an industry wide policy might produce. There is no magic bullet to get industry to support the Army's TCP. It is not know whether or not we are properly educating our officer corps for the faster pace of high technology and the increased emphasis on research and development on our programs.

The key to better understanding how to manage the acquisition system is to consider it as a complex adaptive system. It is a system with multiple interrelated agents that create self-organizing networks. It is a co-evolving system as each of the agents seeks to better their condition. Furthermore, it is in the nature of complex adaptive systems that one cannot predict accurately because the future is unknown, and inherently unknowable. The further one tries to predict into the future, whether it is a program plan, acquisition strategy, or anything else, the more wrong one will be. Searching for more data, or a better database, or more information will also not work.

Professor McDaniel, who teaches Managing Complexity at the University of Texas, stated "the search for more information is often a trap, using a linear thought process to solve a non-linear problem."[33] The process cannot be managed as it has been in the past. Mr. David Smith of Technology Futures, Inc., states that the pace of change is becoming, "absolutely blinding". He further states that, "[there is an] inability to maintain centralized control over rapidly changing organizations and environment."[34] It is not the rapidity in and of itself that causes the problem, however, rather it exacerbates the real problem of trying to use linear thought processes and

management techniques to manage a non-linear system. It is the non-linearity that is the root cause of the problem.

CONCLUSION AND RECOMMENDATIONS

Part of the answer to the dilemma presented is that we must train and educate our personnel to manage differently. Dr. Perino gave us the first clue by warning us that, "The tendency is to under-conceptualize interrelationships, thereby avoiding cognitive overload."[35] He also stated that Advanced Program Management College (APMC) attendees tended to be overly focused on getting near term results rather than on actual problem solving. He proposed changing the curriculum at the DAU from its undue emphasis on, "objectivity and the deterministic, mechanistic, and reductionist perspectives of the late 19th and 20th century science," and replacing it with an education process that prepares graduates to operate, "within the nonlinear, non-deterministic reality of large scale socio-technical systems."[36]

The mindset in the contracting workforce must be changed. Too often the workforce has been taught that their job is to write the "perfect" contract, with a specification that is complete and clear. That way there will be no cost overruns, no misunderstandings, and no changes. When this doesn't happen, everyone senses failure, and thinks the process is broken. And then the process is "fixed" with "reforms" that, though well meaning, don't usually help. This mindset is hopelessly wrong. It assures that all of the bad things above will happen.

The workforce must be taught that a contract is merely a tool that establishes the basis for a relationship with a supplier; fully understanding that what is wanted will change. The contractor might very well have misunderstood what was wanted. The situation will change. The point is that contract administration is about communication and working out relationships in a businesslike but amicable manner. In fact, there is no good reason why the various parts of

the acquisition system, to include requirements developers, shouldn't be in continuous "negotiations" (discussions) with the contractors documenting a "relationship" (contract) as funds are appropriated for the purpose. If we haven't decided on a contractor, we talk to all of them who are interested. This is going to happen anyway, why should we try to "control" when and how we work with our suppliers? The more open the communications, the more free the various agents are to interact, then the more rapid will be the adaptation to changing situations. This is not inconsistent with the controls necessary to protect the Government's financial interests. Indeed, ethical problems usually occur when communications are less free, and restricted. Trust thrives in an environment of openness and honesty.

Traditional linear barriers between job titles and job descriptions must be broken. There must be no rice bowls. It is certainly true that the congress requires that only properly warranted individuals can obligate the Government. It is also true that only a finance officer can authorize disbursement of funds, and only a Program Manager can approve the commitment of funds. However, instead of the individual in each of these situations regarding their authority as a "fiefdom" to be "protected," they should each consider how to communicate more effectively and how to support one another. For each program, there needs to be a support team created, with the key personnel, some of whom are mentioned above, listed as members, and brought together regularly to insure they are each aware of the others needs. And all must be continually reminded why they are on this team – to put the best technology in the hands of our soldiers to save lives and win wars.

Might we also need some regulatory changes? Possibly, but it is doubtful. The solution lies in changing how to think about the process; seeking to better understand the relationships; and build methods for changing into the contract. Reliance on a mechanistic "changes" clause is likely to be inadequate. Each acquisition must be thought through and (as a team) documenting the relationship. The "Alpha" team method for negotiating contracts is a winner. It

has been used, and it works. But mostly, all involved in the process must seek to understand that we must learn to build relationships so that as changes occur it is accepted as natural and that the focus is on *solving problems as a normal part of business*, not as a series of "failures" to get through.

People manage in a different way once they've acknowledged that one can't predict the future. The first step is to understand one's environment. The Four Factors of Leadership stated in the situational leadership model in FM 22-100 Military Leadership are an excellent start. They lacks only one key part, and that is to understand the relationships of the various agents involved in the part of the system one is trying to manage. According to FM 22-103, Leadership and Command at Senior Levels, "Senior leaders or commanders add to their direct leadership competencies an understanding of organizational structure and climate needed to effect indirect leadership. Their focus becomes one of building teams and exerting influence through subordinate commands and staffs."[37] According to Mr. Eric D. Beinhocker, "We should take a cue from nature and change the way we develop business strategy, relying less on our ability to make accurate predictions and more on the power of evolution."[38]

When one develops an acquisition strategy for a new system, change must be built into the strategy. None of this is easy. There is the reality of an annual appropriation process. We have the reality of congressional oversight. The FCS is a system of systems. A "Team of Teams" must therefore, manage it. If managed as a traditional program, it will fail. The "program" team will probably have to be composed of representatives from each of the other teams involved: the contractor team, customer team (TSM), DOD oversight team, Army oversight team, testing, contracting, and all the rest. The primary job of the FCS PM will be to *make sense of the system and all of its relationships*. Then he must insure that everyone can communicate. Trying to predefine "feedback" loops is a trap. The teams will determine their own feedback loops as needed, but the communication must be made available and facilitated.

For a complex team such as the FCS, the author would propose hiring a psychologist to assist in building the teams. This is common practice in software companies to insure that the diversity necessary for rapid and effective resolution of problems is accomplished. Organizational models will need to be built to facilitate understanding. Since there is no manual or textbook on how to manage complex adaptive systems, then there will need to be some education on various techniques and procedures. FM 22-103 Leadership and Command at Senior Levels still has some of the best advice and techniques, even after reviewing various materials on complex adaptive systems.

The bottom line is to remember that just when one thinks that the process is known, and how it can best be managed, it has already changed! The best way to manage complex adaptive systems is how we teach combat. Continually update the situation, make sense of the situation, make plans, but build into them contingencies for unforeseen events, and then adapt to the situation as it unfolds to continue on to the objective.

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[25] From a list of questions for SSC Fellows at University of Texas provided by Ms. Karen Walker in August, 2001.

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